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AUTHOR Moely, Barbara E.; And Others
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ABSTRACT

The aim of this research was to determine whether individual differences in the use of memory and problem-solving strategies by elementary school children are related to teachers' use of strategy suggestions in the classroom. High, average, and low achievers of first- through third-grade levels (n = 38) were selected from classrooms of eight teachers who had been observed frequently suggesting cognitive processes and strategies to children. For comparison, 26 children were chosen from five classrooms in which teachers rarely made such suggestions. In individual sessions, children were given a free recall task, trained in an organizational strategy for free recall, and assessed for strategy maintenance. Although all children showed improved recall performance and increased strategy use immediately after training, groups varied in performance on a later test trial. Average and low achievers whose teaachers were high in strategy suggestions showed maintenance superior to that shown by similar children whose teachers rarely made strategy suggestions. This difference appeared for recall performance, recall organization, and among younger children, for category sorting during study. Children whose teachers often suggested strategies were better able to verbalize an accurate recollection of training instruction. Children who were high in achievement generally showed excellent maintenance of the trained strategy, independent of teacher characteristics. (Author/RH)

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Relationships between Teachers' Cognitive Instruction and Children's Memory Skills

Barbara E. Moely, Linda Leal, Ellen M. Pechman, Terry D. Johnson, Kevin A. Santulli, Nirmala Rao, Silvia S. Hart, and Libbi Burney

Department of Psychology

Tulane University

New Orleans, LA 70118

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Abstract

The aim of this research was to determine whether individual differences in the use of memory and problem-solving strategies by elementary school children are related to teachers' use of strategy suggestions in the classroom. High, average, and low achievers of first- through third-grade levels (N = 38) were selected from classrooms of eight teachers who had been observed to make frequent use of suggestions regarding cognitive processes and strategies that children could use in classroom activities. For comparison, 26 children were chosen from five classrooms in which teachers rarely made such suggestions. In individual sessions, children were given a free recall task, trained in an organizational strategy for free recall, and assessed for strategy maintenance. Although all children showed improved recall performance and increased strategy use immediately after training, groups varied in performance on a later test trial: Average and low achievers whose teachers were high in strategy suggestions showed maintenance superior to that shown by similar children whose teachers rarely made strategy suggestions. This difference appeared for recall performance, recall organization, and among younger children, for category sorting during study. Children whose teachers often suggested strategies were better able to verbalize an accurate recollection of the training instruction when queried at the end of the task, as well. Children who were high in achievement generally showed excellent maintenance of the trained strategy, independent of teacher characteristics.

Relationships between Teachers' Cognitive Instruction and

Children's Memory Skills

In earlier work, we have shown that teachers vary in the extent to which they describe cognitive processes useful for dealing with classroom tasks, including suggestions for the use of memory strategies and rationales for their use (Hart, Leal, Burney, & Santulli, 1985). Teachers also vary in their sensitivity to developmental differences in memory skills (Moely, Santulli, & Rao, 1985). The present study was an exploratory effort to determine how children's learning styles are affected by exposure to teachers who hold varying orientations toward cognitive instruction.

On the basis of observations made for an earlier study (Moely, Leal, Hart, Burney, Rao, Santulli, Johnson, & Pechman, 1985), it was possible to identify a number of competent and interested teachers who were similar on many demographic characteristics, as well as in various classroom behaviors, but who varied in the extent to which they instructed children in appropriate cognitive processes to use in dealing with classroom tasks. Children of high, moderate, and low achievement levels from the classrooms of these teachers were seen in individual sessions in which they were exposed to several tasks assessing memory strategy use, knowledge about study activities, and the capacity to profit by a simple memory strategy training procedure. Data were gathered in the last month of the school year, when children had experienced approximately eight months with a teacher who either frequently made memory strategy suggestions or rarely made such suggestions. After such extensive exposure to a particular teaching style, we felt that children might reflect their teachers' approach to memory tasks.

The tasks we used varied in their similarity to tasks the child might encounter in school. Of major interest for the present report was a free

recall task, in which children could remember effectively by employing a category grouping strategy. It was used both to assess initial strategy use and to evaluate the effects of a simple training procedure. Two other tasks, more similar to school activities, were used in order to assess strategy use in spelling and arithmetic activities. Findings for these tasks are reported elsewhere (Moely, et al., 1985).

The aims of the present study, then, were 1) to compare the performance of children varying in grade level, achievement, and teacher's instructional style on tasks measuring memory ability and strategy use, and 2) to evaluate the effects of a brief training procedure on subsequent recall task performance by children from these several groups. This paper will focus on findings for a free recall training task, in which teacher characteristics proved to be of considerable importance in accounting for children's performance.

Method

Subjects

Children (N = 64) of high, moderate, and low achievement levels were selected from 13 classrooms. Characteristics of the children are shown in Table 1, which summarizes sex, racial, and age characteristics, and gives achievement test percentile scores (national norms) obtained on Reading and Math sections of the Comprehensive Test of Basic Skills. The children were attending classes taught by teachers either high or low in their tendency to make suggestions about cognitive activities during learning. The eight teachers high in strategy suggestions and the five teachers low in use of such suggestions did not differ on measures indexing total classroom activity, interactive teaching activities, responses made to children's errors, procedural instructions, or communication of task-related information. Only on

behaviors involving suggestions for cognitive processes, strategy use, and rationales for strategy use did the groups differ. The two groups of teachers also were similar in demographic characteristics, including age, years since receiving the Bachelor's degree, years spent in teaching, years of teaching the grade presently taught, and the number of children in their classrooms at the time this work was done.

Materials

Items were 40 line drawings representing easy-to-label objects from 8 conceptual categories. Similar items have been used in a number of studies investigating recall in elementary school children (Black & Rollins, 1982; Moely & Jeffrey, 1974; Moely, Olson, Halwes, & Flavell, 1969); as in those studies, items were ones that children were able to group categorically. To roughly equate task difficulty across grades, the number of items on each list was varied systematically by grade level. On each trial, first graders saw 12 items (3 items from each of four categories), second graders saw 16 items (4 items per category), and third graders received a 20-item list (5 items per category).

Procedure

Children were seen by one of two female experimenters, in individual sessions that lasted approximately 30 minutes. All children first received two trials on a free recall task. The initial trial (pretest) assessed their spontaneous use of organization and other study strategies, while the second (training) trial was used to provide simple instruction in the use of category organization during study and recall. Standard free recall instructions were given in introducing the first trial. Immediately following the child's recall, the experimenter carried out a brief instructional session in which the child

was encouraged to group the items used on the pretest into conceptual categories. Procedures for study and retrieval according to category groupings were described and the child was told that category grouping would aid his/her recall. Each child was then asked to attempt a second recall of the items used on the pretest, using the procedure that had been instructed. After intervening tasks that lasted 15-20 minutes, children received a final free recall trial (posttest) in order to assess the extent to which the trained strategy would be applied to a new list, in the absence of a specific suggestion to do so. This task was introduced in the same manner as the pretest, and no reference was made to previous free recall trials or instructions.

On each trial, the child was permitted to study items until ready to recall. The experimenters recorded study behaviors observed during each 10-s interval of the child's study. Study behaviors recorded were naming, moving or looking at the pictures, and self-testing. At the end of the study period, total time spent studying, recall performance, and the extent to which the child had grouped items by category during study period were recorded. Following each trial, children were questioned about procedures used in study and recall. Reliabilities of the observational categories used to describe study behaviors and of the codes used to classify verbal responses (described below) were adequate. (For study behaviors, Cohen's Kappas ranged from .69 to 1.00; classification of verbal responses showed interrater agreements of 83% to 100%.)

Results

Recall performance. The proportion of items recalled varied over trials, as might be expected if a training effect occurs, but more importantly, the

nature of change over trials was not the same for all groups. As indicated in Figure 1, there were differences in the extent to which training was maintained at the time of the posttest for groups of children varying in achievement level and teacher characteristics. Children of low or moderate achievement levels, whose teachers rarely offered strategy suggestions, recalled less information at the time of the posttest than did other groups. High achievers, on the other hand, did well regardless of teacher characteristics.

These findings are supported by an analysis of variance performed on the recall scores, which included grade (3 levels), teacher (high or low in strategy suggestions), and achievement level (high, moderate, low) as between-subjects variables and trials (pretest, training, posttest) as a within-subjects variable. An overall trials effect, $F(2, 92) = 50.43$, $p = .000$, reflected increases in recall from the pretest ($M = .63$) to training ($M = .85$) and posttest ($M = .81$). The interaction of Teacher x Achievement x Trials, $F(4,92) = 3.86$, $p = .006$, is shown in Figure 1, and qualifies both a significant effect of achievement level, $F(2,46) = 3.95$, $p = .026$ and an interaction of Achievement Level x Trials, $F(4, 92) 2.58$, $p = .042$. To explicate this interaction, followup analyses of variance were made of data for each trial, involving grade, teacher, and achievement level. Only on the posttest trial did an interaction of Teacher by Achievement appear, $F(2, 46) = 4.23$, $p = .021$. Newman-Keuls tests of the means for the posttest trial showed, for children whose teachers were low in strategy suggestions, poorer recall by moderate achievers than high achievers ($p = .001$) and a trend for lower recall by low than by high achievers ($p = .079$). Thus, as seen in Figure 1, the differential influence of teacher characteristics on children of varying achievement levels appears only on the assessment of strategy maintenance at

posttest.

There was also a difference in proportion of items recalled by children of different grade levels, $F(2,46) = 4.14$, $p = .022$, which simply indicates that the effort to equate difficulty level by varying the number of items given to children of different grades was not entirely successful. First graders ($M = .80$) had a somewhat easier task than did second ($M = .75$) or third ($M = .73$) grade children, although no apparent floor or ceiling effects were present at any grade.

Use of Category Organization during Recall. Use of category organization during recall was assessed by means of the ratio of repetition (RR) index of category clustering (Frender & Doubilet, 1974). Two major findings concerned differences between children from classrooms where teachers varied in strategy suggestions, as this classification interacted with both achievement and grade levels in determining strategy use. First, as indicated in Figure 2, low and average achievers from classrooms in which teachers were low in cognitive and strategy suggestions showed less use of category clustering on the posttest. These results closely mirror those shown above for recall scores, suggesting that variations in recall performance are due at least in part to the failure of these two groups to maintain use of the trained strategy. A second pattern of findings concerns differences in use of recall clustering by children of different grade levels whose teachers vary in use of cognitive and strategy suggestions. First graders showed a greater difference in recall clustering as a function of teacher characteristics than did other grade levels.

An analysis of variance of clustering scores including grade, teacher, and achievement level as between-subjects variables and trials as a within-subjects variable supported these interpretations. First, with regard to the

information in Figure 2, the analysis showed a dramatic overall increase in category clustering from the pretest (M= .27) to the training trial (M = .85), which was well maintained on the posttest trial (M = .81), $F(2, 92) = 180.14$, $p = .000$. The interaction shown in Figure 2, Teacher x Achievement Level x Trials, $F(4, 92) = 4.36$, $p = .003$, reflects less maintenance of an organizational strategy by low and moderate achievers who have spent the year studying with a teacher who rarely makes strategy suggestions than is the case for high achievers in the same classrooms or for any children who have studied with teachers high in strategy suggestions. An almost significant interaction of Grade x Teacher x Achievement Level x Trials, $F(8, 92) = 1.92$, $p = .066$, suggests that this effect is more pronounced at first grade than at other grade levels. Followup analyses of variance performed on data for each trial showed, for the posttest trial only, interactions of Grade X Teacher, $F(2, 46) = 3.87$, $p = .028$ and Teacher X Achievement Level, $F(2, 46) = 3.16$, $p = .050$. Tests of means for the grade by teacher interaction showed that first grade children whose teachers were low in strategy suggestions tended to cluster less than first graders whose teachers were high in strategy suggestions ($p = .087$) and also tended to use clustering less than second ($p = .078$) and third graders ($p = .112$) whose teachers were low in strategy suggestions. The teacher by achievement level interaction on the posttest trial was attributable to differences between children of teachers low in strategy suggestions: moderate achievers clustered less than high achievers ($p = .040$) and low achievers tended to cluster less than high achievers ($p = .110$).

A second finding also concerns grade differences in recall clustering. There were fairly regular overall increases in clustering across grade level, $F(2,46) = 9.93$, $p = .000$. A more interesting finding is an interaction of

grade by teacher, $F(2, 46) = 4.41$, $p = .018$, which indicates that at the first grade level, children whose teachers often made strategy suggestions used category clustering more than did those whose teachers were low in strategy suggestions. An analysis of first-grade data only shows a difference between high and low teacher groups, $F(1, 17) = 7.81$, $p = .012$. No such teacher differences appear at either second or third grade.

Category Organization during Study. Grouping of items by category during study was found to reflect the patterns described above for recall and recall clustering. Children of moderate and lower achievement levels from classrooms in which teachers rarely suggested strategies were less likely to sort items by category as they studied during the posttest. This was particularly true for the first graders, whose performance is depicted in Figure 3. Second and third graders, once shown the possibility of grouping by category during training, often did so on both the training and the posttest trials.

These patterns are responsible for an interaction of Grade x Teacher x Achievement Level x Trials, $F(8, 92) = 2.51$, $p = .016$. When first-grade data are analyzed separately, an interaction of Teacher x Achievement Level x Trials, $F(4, 34) = 4.03$, $p = .009$, reflects the group differences shown in Figure 3. Followup analyses of first graders' data showed no significant effects of teacher or achievement level on the pretraining trial or the training trial. At the posttest, first graders showed a significant difference as a function of teacher, $F(1, 17) = 6.89$, $p = .018$, which is qualified by a significant interaction of teacher by achievement level, $F(2, 17) = 5.40$, $p = .015$. Tests of the means for this interaction showed that at the posttest, first graders who were taught by teachers low in strategy suggestions varied according to achievement level. Among these children, low achievers sorted by

category less than high achievers (p = .020) and moderate achievers tended to sort by category less than high achievers (p = .076). First graders whose teachers were high in use of strategy suggestions did not vary significantly by achievement level.

In separate analyses, second and third graders showed no interactions involving teacher and achievement level. Each of these grades showed only a strong change over trials in the amount of category sorting carried out during study. For second graders, an increase from pretest (M = .09) to the training trial (M = 1.91) was shown, which was maintained to a considerable extent on the posttest trial (M = 1.78), $F(2,34) = 124.02$, p = .000. For the third graders, also, little sorting by category was shown on the pretest (M = .11), with a change to complete category grouping by every child in the third-grade sample on both the training and the posttest trials (M's for both training and posttest = 2.00), $F(2, 24) = 235.11$, p = .000. For second and third graders, no differences in category sorting were shown as a function of teacher characteristics or achievement level.

Another index of the extent to which children responded to instructions to group items during study was the measure of proportion of all 10-s study intervals in which children moved the pictures. This is a less precise index of category grouping than the experimenter's rating of the extent of categorization in the sort (above), since any moving is coded, whether or not it involved placing items into category sets. Apparently children learned from the training instruction that they should move pictures, since there was an overall increase from the pretest (M = .13) to the training trial (M = .69) in the children's tendency to do so, an increase that was well-maintained on the posttest (M = .62), $F(2, 92) = 90.54$, p = .000. No differences in the tendency

to move pictures appeared as a function of grade, teacher characteristics, or achievement level, indicating that children equally often learned from the training instruction that they should move items, even if they didn't consistently move the items into category sets.

Use of a Self-testing Strategy during Study. A very general strategy that was potentially useful in the recall task was self-testing. The self-testing strategy is applicable in a wide range of learning situations in which children must evaluate their current state of knowledge so as to determine whether the goal of study has been accomplished. On each recall trial, children were allowed to study as long as they wanted, and were instructed to tell the experimenter when study was completed. In this situation, self-testing would be a practical and accurate means by which to tell if adequate study has been carried out. In self-testing, children essentially engage in a self-regulated test of recall and then check to see how well recall is accomplished. Training did not focus on this strategy, so it was not expected that children would show a change in its use over trials. However, it was possible that training might produce a more general effect on children's study, perhaps by motivating them to use available strategies to a maximum extent. In order to determine the nature and extent of training effects on self-testing, the child's use of this strategy during 10-s study intervals was also examined.

Use of a self-testing strategy was a relatively rare occurrence, observed on only 4.5% of the 10-s study intervals for the sample as a whole. Third graders showed greater use of the strategy ($M = .12$) than did first graders ($M = .002$) or second graders ($M = .03$), $F(2, 46) = 9.03$, $p = .001$. Self-testing did not increase over trials, indicating that training was relatively specific in its effects, and did not induce children to use a potentially helpful

strategy not mentioned in training. This conclusion is qualified, however, by a higher order interaction of Grade x Achievement Level x Trials, $F(8,92) = 2.65$, $p = .011$. Examination of the mean scores for this interaction indicated that for one group, the third-grade high achievers, there was an increase in self-testing from the pretest ($M = .14$) to the training ($M = .24$) and posttest ($M = .18$) trials. For this most mature group, then, training had a more general effect of encouraging effective study apart from the particular activity trained. For all other groups, however, self-testing either decreased or remained relatively constant at a very low level from the pretest to the training and posttest trials.

Other Study Activities. Other study activities were two relatively immature strategies, looking at and naming items. These strategies usually are negatively related or uncorrelated with recall performance for children of the age levels observed here, and apparently contribute relatively little to the child's learning. Both of these study activities showed a decrease from the pretest to the training and posttest trials, as children adopted more active strategies of moving pictures and studying them in conceptual categories.

Looking decreased from the pretest ($M = .92$) to the training trial ($M = .49$), but then increased slightly from training to posttest ($M = .58$), $F(2, 92) = 60.16$, $p = .000$. Naming of items during study also decreased from a mean of .50 on the pretest trial to .25 at training and .33 on the posttest trial, $F(2 92) = 12.80$, $p = .000$. For naming, change over trials varied for children of different achievement levels, $F(4, 92) = 3.34$, $p = .013$, with highest initial use of naming and the greatest decrease over trials shown by children of the lowest achievement level.

Experimenters recorded the length of time that each child spent in study

on each recall trial. Training produced an increase in the amount of time children studied, from a mean of 68 s at pretest to a mean of 84 s at training and 85 s at the time of the posttest, $F(2, 92) = 7.97$, $p = .001$. Overall, older children studied longer than younger, $F(2, 46) = 6.97$, $p = .002$, from an average of 58 s among first graders to 83 s for second graders and 100 s for third graders. An interaction of Grade x Trials, $F(4, 92) = 3.41$, $p = .012$, is due to a lesser change from pretest to training for the second-grade group than for others, a finding of no particular value in accounting for performance findings.

Children's Metacognitions about Study and Recall Strategies. Children were given several interview questions to assess their metacognitions about category organization as a study and recall strategy. First, children's descriptions of how they had studied the items on each of the three recall trials were coded according to whether or not categories were mentioned. Analysis of these scores indicated that categories were mentioned more often during training ($M = .83$) and at the posttest ($M = .73$) than on the pretest trial ($M = .11$), indicating a greater awareness of the potential usefulness of the category structure of the lists following the brief training procedure, $F(2, 92) = 70.53$, $p = .000$. There was also a trend for children of high strategy teachers to mention of categories more following posttest recall than did children of low strategy teachers ($p=.091$). When the posttest scores were analyzed separately, the teacher difference was significant, $F(1, 46) = 9.10$, $p = .004$. No differences appeared as a function of teacher characteristics for either the pretest or the training trial. Thus, findings for children's reports of strategy use are consistent with the differences among children of high and low strategy teachers on recall clustering measures described earlier.

There was a trend (p = .078) for higher-grade children to mention category clustering more than did lower-grade children, as might be expected as a function of older children's greater verbal skill and metacognitive understanding.

Children were asked at the end of both the pretest and posttest to describe what they had done <u>during recall</u> to remember the pictures, and answers were coded for description of organizational strategies. Analyses indicated that children were more likely to mention organization as a way to remember when queried following the posttest (M = .94) than they had been in the pretest (M = .28), $F(1, 46) = 23.68$, p = .000. This was particularly true for high and moderate achievement level children; low achievers showed considerably less change over trials than did other groups. An interaction of Achievement Level x Trials, $F(2, 46) = 4.46$, p = .017, highlights this pattern. Finally, analysis indicated that third-grade children (M = .86) were more likely to mention organization in their responses than were second (M = .57) or first graders (M = .46), $F(2, 46) = 3.37$, p = .043.

To determine what children had learned during training about the use of category organization as a strategy for recall, they were asked at the end of the post test to describe the training instruction. Analysis indicated variation in recollection of the training as a function of both teacher characteristics and children's achievement level. Children whose teachers were high in use of cognitive strategy suggestions in the classroom were more likely to verbalize an accurate recollection of the training instruction (M = .95) than were those children whose teachers rarely offered strategy instructions (M = .65), $F(1, 46) = 9.10$, p = .004. Low achievers showed less accurate recollections of training (M = .68) than did moderate (M = .95) or high

achievers (M = .83), $F(2, 46) = 3.41$, p = .041.

Finally, children's responses to questions about study were examined to determine whether children mentioned using self-testing or some other organized procedure in deciding when to terminate study. Although no instructions about how to determine completion of study were given during training, children showed an increasing tendency from the pretest (M = .58) to the posttest (M = .83) to mention some procedure for determining when to stop studying, $F(1, 46) = 8.57$, p = .005. There was also an increasing tendency with grade level to describe the use of a systematic procedure for deciding when to end study, $F(2,46) = 5.94$, p = .005, which is consistent both with the grade differences seen in the use of the self-testing strategy during recall and with the generally increased metacognitive skills of children across grade levels.

Discussion

A primary goal of the present study was to determine whether there were differences in the memory task performance of children whose teachers varied in the extent to which they made cognitive strategy suggestions in the classroom. Analyses indicated that teacher characteristics had differential effects for children of varying achievement levels. Children of high achievement levels were positively affected by a brief training procedure, maintaining strategy use on a posttest trial with new materials. Among average and low achievers, however, the degree to which maintenance of the trained strategy was shown was related to teacher characteristics. In particular, average and low achievers whose teachers were high in strategy suggestions in the classroom were more likely to use organization during recall, to recall more items, and to organize items to a greater extent during study (the latter was especially obvious at first grade). In general, children whose teachers were high in strategy

suggestions showed a greater ability to articulate verbally the features of the organizational strategy that they were taught. They also were better able to recollect the essential features of the category training procedure when queried at the end of the session than were children who had spent the school year with a teacher who rarely made strategy suggestions. Thus, a pattern of varying benefit of training appears on several measures that index use of category grouping as a study/recall strategy, lending strength to a conclusion that teacher characteristics influence children's reaction to training.

There were several indications that first graders were particularly affected by their teachers' use of strategy suggestions. For both sorting and recall clustering measures, first graders showed variations in performance that were related to teacher characteristics. First graders have had less total exposure to teachers, and thus, may be particularly susceptible to a teacher's emphasis on cognitive processing strategies. First graders are also more dependent upon the teacher as a source of information about how to study than older children are, since their own limited metamemory and self-regulatory skills make them less able to invent and accurately evaluate their own ways of learning.

The brief training instruction was generally quite effective in promoting strategy use in this sample. Several components of the instruction were important in creating this effect: children were encouraged to participate actively in sorting items by category during the instruction period, they received a practice trial on which they were prompted to use the strategy, training instructions directly connected sorting during study with ordering of items by category during recall and suggested a retrieval strategy based on category organization, and finally, children were given an explicit rationale

about the usefulness of the strategy in improving performance as well as feedback about their success in using it. Thus, training was both explicit and detailed, requiring the child to be active in using the trained procedure, and providing a rationale for the strategy. Considerable maintenance was shown on the posttest, although the study did not provide a strong test of maintenance, since the posttest was given in the same session, by the same experimenter who had provided training, and was separated from training only by two other brief tasks. Thus, it is not surprising that children maintained the strategy as well as they did, although it is, perhaps, surprising that average and low achievers with low strategy teachers did NOT maintain the strategy any better than they did.

Other study strategies were also observed. The child's tendency to move pictures was affected very strongly by training, since instruction directly included mention of such activity. No instructions were given about the use of three other strategies observed during free recall study. For looking and naming, there was a decrease in use over trials for the sample as a whole, as children came to engage in other strategies that replaced these less effective ones. Self-testing occurred much less often than other study strategies, and in fact, was relatively non-existent in the youngest group. With age, there was an increase in both observed self-testing and the child's tendency to describe the use of a self-testing strategy during study. Generally, training did not have any effect on the child's use of self-testing during study. However, for one group of children, a training effect did appear: For the most developmentally mature group in the sample (the high achievers at the third grade level), self-testing in preparation for recall increased from the pretest to later trials. The training procedure may have had a generally motivating

effect for these children, so that they not only used the trained strategy, but were able to go beyond training to generate another useful and effective strategy.

From these findings, we can speculate about the teacher's role in affecting a child's learning activities. When children were required to learn a novel strategy, moderate and low achievers were able to benefit by strategy training to a greater extent if their classroom teacher was one who regularly suggested strategies for studying than if their teacher rarely did so. A "high strategy" teacher, then, may be influential in setting the stage for learning about effective cognitive processing strategies. Such teachers may be affecting children's metacognitive learning capabilities, as well as their task performance, when they offer strategy suggestions in the classroom. This study was an exploratory effort to determine whether teachers' cognitive strategy instruction might influence children's learning. Although the design of the present work does not allow a causal inference about the role of teaching, findings are consistent with the notion that teachers may have such an influence on the child's ability to learn, use, and conceptualize effective study-recall strategies. Thus, these findings provide a basis for interventions directed at increasing teachers' efforts to influence the cognitive processing activities involved in children's learning.

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Table 1

Characteristics of Children from Classrooms of Teachers High and Low in Strategy Suggestions

	High Strategy (N = 38)	Low Strategy (N = 26)	Total (N= 64)
Characteristic			
% female	50%	46%	48%
% minority	66%	58%	63%
Chronological Age (Months)			
Grade 1	83.4	81.2	82.3
2	96.3	95.8	96.1
3	107.8	108.0	107.8
High Achievers	(N = 13)*	(N = 10)	(N = 23)
Reading (%ile)	84.62	83.90	84.3
Math (%ile)	88.00	88.70	88.3
Moderate Achievers	(N = 11)	(N = 7)	(N = 18)
Reading (%ile)	72.00	55.14	65.4
Math (%ile)	77.00	74.57	75.9
Low Achievers	(N = 11)	(N = 5)	(N = 16)
Reading (%ile)	49.4	43.8	47.6
Math (%ile)	66.11	35.20	55.1

*Achievement test scores (CTBS) were not available for a few children.

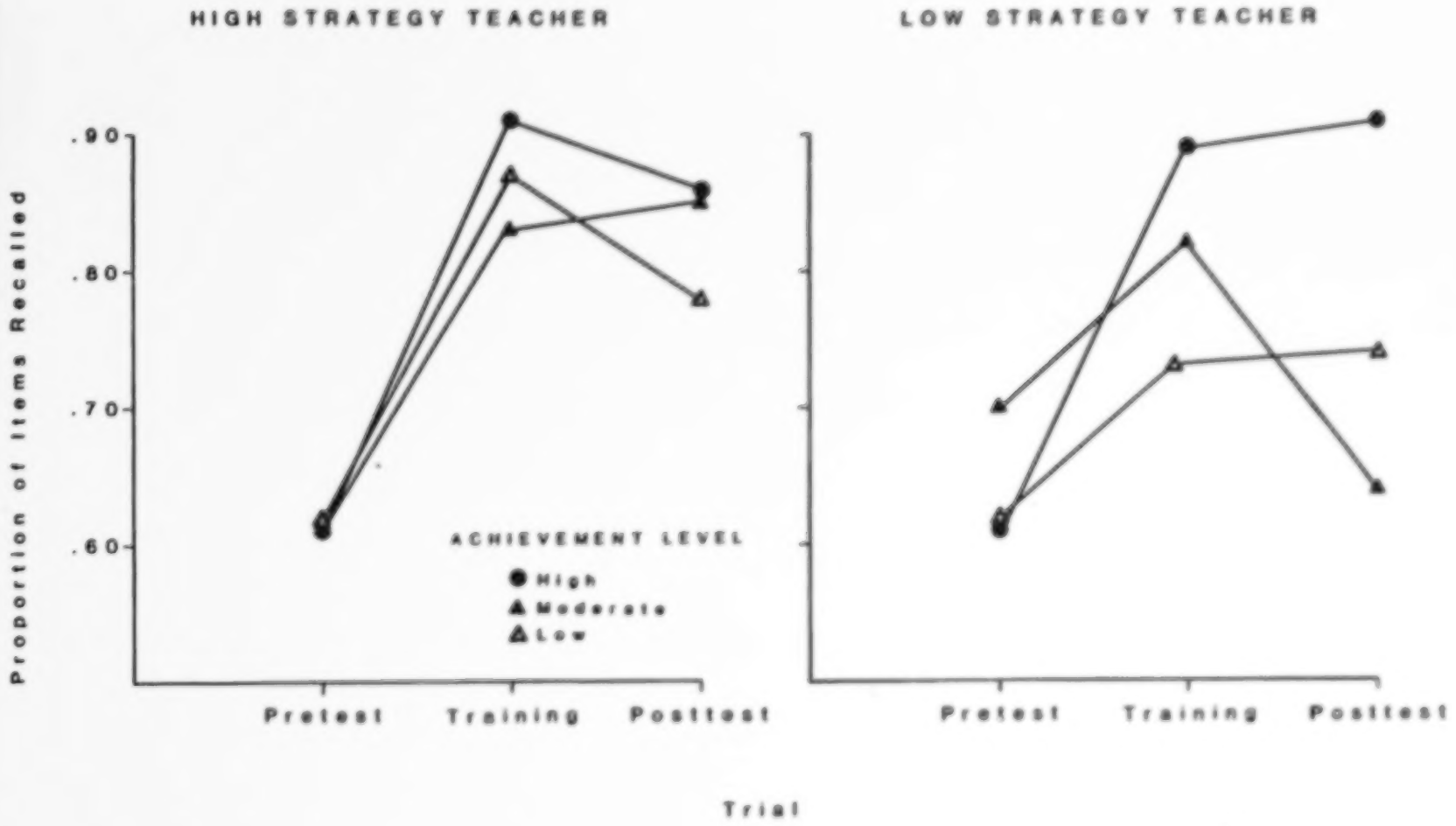

Figure 1. Recall Performance by Children of Three Achievement Levels Whose Teachers Differed in Use of Fognitive Strategy Suggestions

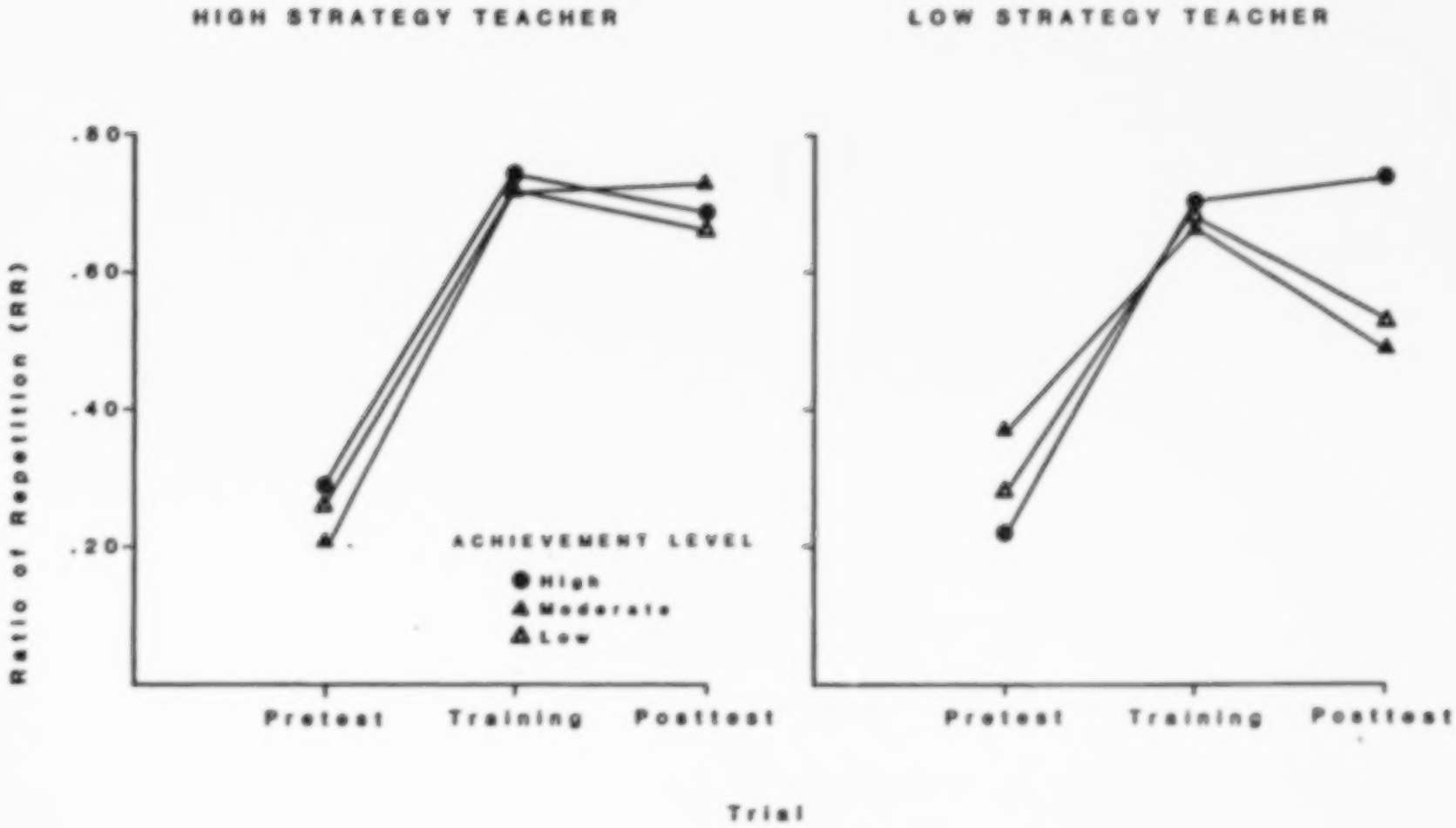

Figure 2. Recall Clustering by Children of Three Achievement Levels Whose Teachers Differed in the Use of Cognitive Strategy Suggestions

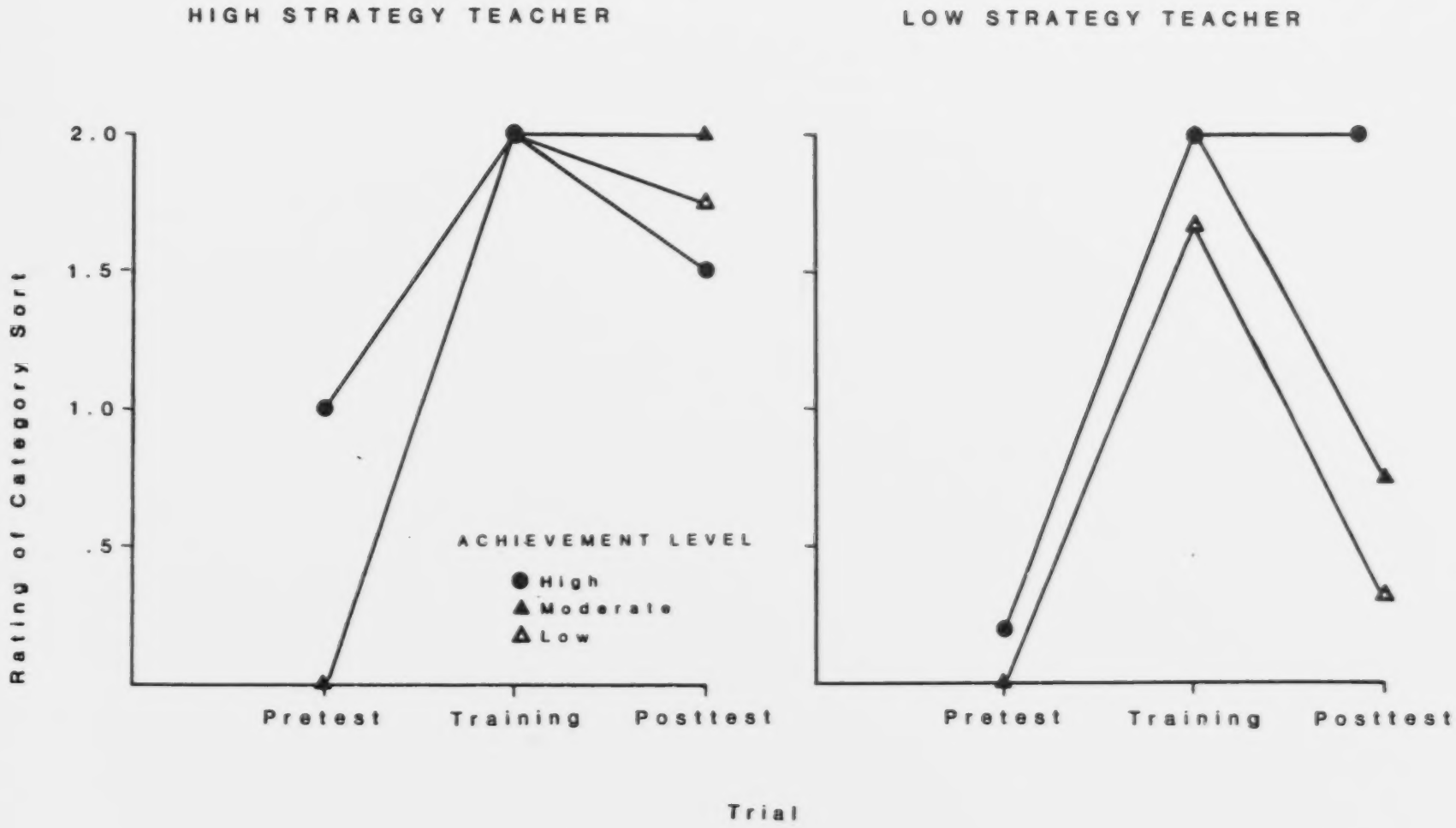

Figure 3. Category Sorting During Study by First-Grade Children Varying in Achievement Level and Teacher Characteristics